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disruption of the comet. (The comet, as observed, consisted of four separate parts.) * * * *

"There are many interesting problems connecting this comet with the fifth satellite of *Jupiter*. There is certainly great probability that the satellite passed directly through the comet; the mean path of the comet intersected that of the satellite, so that a direct collision was possible. Unfortunately the slight uncertainty in the comet's motion is here complicated by an additional uncertainty in the motion of the satellite, which renders it impossible to say definitely that a collision did or did not take place. It is possible, therefore, that the observed disruption of the comet was caused by the action of the satellite. But, all things considered, it is more probable, I think, that it was caused by *Jupiter* itself.

"*Jupiter* differs greatly from a sphere; its ellipticity being one-seventeenth. Hence, in treating of its action upon the comet, the shape of the planet must be taken into account. An investigation shows that the introduction of terms depending upon the shape of the planet caused little or no difference in the actual motion of the nucleus about the Sun. On the other hand, we find in the unequal attractions, due to the non-sphericity of *Jupiter*, on the various parts of the comet, when at perijove, a ready explanation of the observed disruption.

"Among the many interesting problems yet to be fully discussed is this entire question of the breaking up of the comet; as well as the possibility that a portion of it was permanently drawn into the Jovian system, thus forming a new satellite or satellite ring."

THE VARIATION OF TERRESTRIAL LATITUDES, BY DR. S. C. CHANDLER.

"At the meeting of the Boston Scientific Society, on March 27, Dr. S. C. CHANDLER presented a report of progress of his investigation of the Variation of Latitude. During the past six months he has been engaged in the reduction of POND'S observations made more than half a century ago at Greenwich, England. In this work he has been assisted by Miss WENTWORTH and Miss COBB, graduates of Boston University, whose skill in the discussion of the problems before them is worthy of much praise."

"The axis of the earth which we imagine to connect the

poles, as represented in the diagrams in the geographies, is termed by astronomers the 'axis of figure,' and is the shortest diameter of the flattened sphere of the Earth. Some years ago it became evident from anomalies in astronomical observations that some phenomenon was producing a curious change in the latitude of all places on the Earth's surface. A consideration of the problem by Dr. CHANDLER convinced him that the Earth did not revolve about its axis of figure, but about another axis which was constantly shifting its position. This other axis describes a circle at the poles, of about 22 feet radius, the time necessary for the completion of its change being 427 days. Closer figuring on the observations soon showed that a secondary revolution of this axis was also in progress. This second revolution is a motion also circular in its nature, in a smaller circle of only 5 feet radius, which is accomplished in a year almost exactly. The periods of these two motions are not the same, and for that reason sometimes they are pulling together, in which case the resultant motion is their sum; and at other times they do not pull in the same direction, and then the amount of the disturbance is diminished. The combined effect of the two motions results therefore in a spiral, with a maximum radius of about 28 feet, which in three and one-half years is reduced to only 2 or 3 feet, and in a like time becomes again as great as before.

"Although the fact that these motions exist has now been accepted almost without exception by astronomers, there has been but little success in the determination of their causes. In order to determine as exactly as possible the laws of the different motions, Dr. CHANDLER has considered, one after the other, all the principal series of observations which have had for their object the determination of latitude. There have been many of these series, and he has been at work for nearly two years, with assistants for the larger part of the time, re-reducing the observations and determining their agreement with his laws. Among other series, he has taken up those of POND, and it is especially of the results of this work that he desired to speak.

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"The POND series has the advantage over others because it covers a sufficient length of time to show the complete round of the combined motions of the two polar movements the period of which, as has been said, is some seven years. These observations furnish also a stepping-stone to those of BRADLEY of nearly

a century before, a time too great to bridge accurately from recent observations, but easily reached now by means of the POND observations. This additional large number of years, by means of which the number of periods of complete variation of latitude is very much increased, furnishes a rigid test of the accuracy of Dr. CHANDLER's computations. From this he finds that his first period, deduced from a comparatively small number of observations, was only a day in error, and that the true time of the revolution of the pole in the larger circle is very nearly 428.6 days.

"It has been shown that the relations of the two motions of the pole are such that sometimes the resulting motion is a large one and sometimes it is but small. At the present time we have just entered a period of small variation. This is a crucial test, and the observations of the next six or eight months will either prove or disprove the accuracy of Dr. CHANDLER's laws. Already statements published by the observatories of Pulkowa and Strasburg, results given to the world within a few weeks, show that at both these places the observations confirm the law.

"One or two related points were briefly commented upon by the speaker. The variation in latitude should affect also to some extent the pointing of meridian circle instruments, and a recent investigation of this matter undertaken by SOKOLOFF has determined that this variation has a period of 428 days, agreeing remarkably well with the variations in latitude.

"Another interesting point is that the French astronomers have been among the very last to allow that any such motion as the variation exists. At last they have prepared an instrument and are about to take some observations. It is curious that during the immediate future, the time during which they will be likely to work, the variation will be very small, and it would not be surprising if they should consider this to be further evidence that the motion does not exist.

"Another result of the investigations has been the elimination of what has been known as temperature derangements. These errors, which have been ascribed to differences in temperature, have been exceedingly annoying, but they now seem to be mostly referable to the known variations of the pole, and for that reason a higher precision and greater refinement in the observations becomes possible."—From the *Boston Commonwealth*, March 31, 1894.